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or, $\frac{h(\sin C \sin E - \cos C \sin E)}{y(\sin A \cos E + \cos A \sin E)} = \frac{\sin C}{\sin A}$; or $h(1 - \cot C \tan E) = y(1 + \cot A \tan E)$, or

$$h - y = (h \cot C + y \cot A) \tan E; \text{ but } \tan E = (h - y)/x,$$

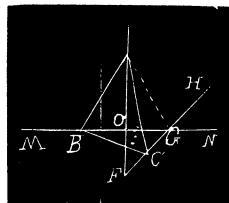
$\therefore x = y \cot A + h \cot C$, or $y = x \tan A - h \cot C \tan A$, as the locus of C .

For $C = A$, we have $y = x \tan A - h$.

Make $OF = OA$, draw FH so as to make $\angle HGN = \angle A$, draw AG . $\angle HGN = \angle OGF = \angle AGO = \angle A$.

Since $\angle BAC = \angle BGC$, $ABCG$ is concyclic.

$\therefore \angle ACB = \angle AGB = \angle A$, $\therefore \angle C = \angle A$, which unifies geometrically for the case in which the angles at A and C remain equal.



92. Proposed by JOSIAH H. DRUMMOND, LL. D., Counselor at Law, Portland, Me.

Let $ABCD$ be a quadrilateral inscribed in a circle. Draw the diagonals AC and BD . Show that $AB \cdot BC : DC \cdot AD = BD : AC$. [From a note in *Young's Geometry*, edition of 1830.]

Solution by the PROPOSER, and J. SCHEFFER, Hagerstown, Md.

Let F be the intersection of the diagonals.

Then $AB : BF :: CD : CF$,

or $AB : CD :: BF : CF$,

and $BC : AD :: CF : DF$.

Hence $AB \cdot BC : AD \cdot CD :: BF : DF$,

(I) and $AB \cdot BC + AD \cdot CD : AD \cdot CD :: BF + DF (=BD) : DF$.

In like manner it is shown

(II) that $AB \cdot AD + BC \cdot CD : BC \cdot CD :: AC : CF$.

But $AD : DF :: BC : CF$,

or $AD \cdot CD : DF :: BC \cdot CD : CF$.

Combining these with (I) and (II), we have

$$AB \cdot BC + AD \cdot CD : AB \cdot AD + BC \cdot CD :: BD : AC. \quad \text{Q. E. D.}$$

Also solved by B. F. SINE, CHAS. C. CROSS, WALTER H. DRANE, and G. B. M. ZERR.

93. Proposed by G. B. M. ZERR, A. M., Ph. D., President and Professor of Mathematics, The Russell College, Lebanon, Va.

While surveying in a level field I notice a mountain behind a hill. Wish- ing to know the height of each I take the angles of elevation of the tops of both and find them to $\beta = 45^\circ$, $\delta = 40^\circ$. I then measure a straight line $a = 400$ feet, and find the angles of elevation of the tops to be $\gamma = 42^\circ$, $\mu = 38^\circ$. After measur- ing $b = 300$ feet more in the same straight line I find the elevations to be $\lambda = 40^\circ$, $\nu = 36^\circ$. Find the height of each.

Solution by the PROPOSER.

Let $AB = 400$ feet $= a$, $BC = 300$ feet $= b$, $OP = x$, $QR = y$.